FORM PTO-1390 (Modified) (REV 5-2000) U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEY'S DOCKET NUMBER	
L9289.01160	
U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR)	
09/889919	

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/JP00/08336	November 27, 2000	November 29, 1999 & March 17, 2000

TITLE OF INVENTION

COMMUNICATION TERMINAL APPARATUS, BASE STATION APPARATUS, AND TRANSMISSION POWER CONTROL METHOD

APPLICANT(S) FOR DO/EO/US

Takashi KITADE, Kazuyuki MIYA
Katsuhiko HIRMATSU, Osamu KATO

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include itens (5), (6), (9) and (24) indicated below.
4. ☐ The US has been elected by the expiration of 19 months from the priority date (Article 31).
5. ☒ A copy of the International Application as filed (35 U.S.C. 371 (c) (2))
   a. ☐ is attached hereto (required only if not communicated by the International Bureau).
   b. ☒ has been communicated by the International Bureau.
   c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☒ An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).
   a. ☒ is attached hereto.
   b. ☐ has been previously submitted under 35 U.S.C. 154(d)(4).
7. ☐ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371 (c)(3))
   a. ☐ are attached hereto (required only if not communicated by the International Bureau).
   b. ☐ have been communicated by the International Bureau.
   c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
   d. ☐ have not been made and will not be made.
8. ☐ An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4)).
10. ☐ An English language translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371 (c)(5)).
11. ☐ A copy of the International Preliminary Examination Report (PCT/IPEA/409).
12. ☒ A copy of the International Search Report (PCT/ISA/210).

Items 13 to 20 below concern document(s) or information included:

13. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
14. ☒ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
15. ☐ A **FIRST** preliminary amendment.
16. ☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
17. ☐ A substitute specification.
18. ☐ A change of power of attorney and/or address letter.
19. ☐ A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821 - 1.825.
20. ☐ A second copy of the published international application under 35 U.S.C. 154(d)(4).
21. ☐ A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).
22. ☐ Certificate of Mailing by Express Mail
23. ☒ Other items or information:

Claim for Priority with PCT/IB/304
PCT/IB/308
PCT/RO/101

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR	INTERNATIONAL APPLICATION NO.	ATTORNEY'S DOCKET NUMBER
09/889919	PCT/JP00/08336	L9289.01160

24. The following fees are submitted:.

BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)) :

		CALCULATIONS PTO USE ONLY
☐	Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO **$1000.00**	
☒	International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO **$860.00**	
☐	International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO **$710.00**	
☐	International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4) **$690.00**	
☐	International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4) **$100.00**	

ENTER APPROPRIATE BASIC FEE AMOUNT =	**$860.00**	
Surcharge of **$130.00** for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (e)).	**$0.00**	

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total claims	6 - 20 =	0	x $18.00	**$0.00**	
Independent claims	2 - 3 =	0	x $80.00	**$0.00**	
Multiple Dependent Claims **(check if applicable).**			☐	**$0.00**	
TOTAL OF ABOVE CALCULATIONS =				**$860.00**	
☐ Applicant claims small entity status. (See 37 CFR 1.27). The fees indicated above are reduced by 1/2.				**$0.00**	
SUBTOTAL =				**$860.00**	
Processing fee of **$130.00** for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (f)). +				**$0.00**	
TOTAL NATIONAL FEE =				**$860.00**	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31) **(check if applicable).** ☒				**$40.00**	
TOTAL FEES ENCLOSED =				**$900.00**	
				Amount to be: refunded	$
				charged	$

a. ☒ A check in the amount of **$900.00** to cover the above fees is enclosed.

b. ☐ Please charge my Deposit Account No. _____ in the amount of _____ to cover the above fees. A duplicate copy of this sheet is enclosed.

c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. **19-4375** A duplicate copy of this sheet is enclosed.

d. ☐ Fees are to be charged to a credit card. **WARNING:** Information on this form may become public. **Credit card information should not be included on this form.** Provide credit card information and authorization on PTO-2038.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

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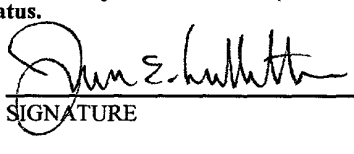

SIGNATURE

James E. Ledbetter

NAME

28,732

REGISTRATION NUMBER

July 25, 2001

DATE

DESCRIPTION

COMMUNICATION TERMINAL APPARATUS, BASE STATION APPARATUS, AND TRANSMISSION POWER CONTROL METHOD

Technical Field

The present invention relates to a communication terminal apparatus that performs transmission power control of an open loop, a base station apparatus, and a transmission power control method.

Background Art

CDMA (Code Division Multiple Access), which is one of multiple access of a radio transmission system, is a method for spreading a spectrum of an information signal to a sufficiently wide band as compared with an original information bandwidth to be transmitted thereto, and it is capable of increasing spectrum efficiency highly, and accommodating numerous users.

In CDMA, however, there is a near-far problem, specifically, in the case where a desired transmitting station is located at a far place and an undesired transmitting station (interference station) is located at a near place, reception power of a signal transmitted from the interference station is increased by reception power of a signal transmitted from the desired transmitting station,

and this makes it impossible to suppress cross-correlation between spread codes by only processing gain to make it impossible to perform communications.

Hence, a cellular system using CDMA needs transmission power control according to a state of each transmission channel in a reverse link. Moreover, in a terrestrial mobile communication, transmission power control for making compensation for a variation in a momentary value of reception power is needed as measures against fading, which is a cause of deteriorating channel quality.

Herein, a duplex system in multiple access includes TDD (Time Division Duplex) and FDD (Frequency Division Duplex).

TDD is a system that time-divides the same radio frequency into a reverse link and a forward link to perform communication, and frequency correlation properties relating to fading variations between transmitting signal and received signal are 1 since the transmission and reception are in the same band. Then, in the case where switching time between both is sufficiently short, it is possible to perform transmission control of the open loop that controls transmission power based on reception power at a communication terminal since TDD has a high cross-correlation in time in a propagation path state such as a fading variation and the like.

Also, in FDD that performs communications at different frequencies between the reverse link and the forward link, when the communication terminal originates a call using RACH (Random Access Channel), transmission power value is determined by transmission power control of the open loop based on a transmission power value of a broadcast channel notified by the broadcast channel, an interference power value at a base station, a target power value at a base station reception end, and reception power of the broadcast channel.

The following will explain the conventional CDMA base station and communication terminal that perform transmission power control of the open loop with reference to the drawings.

FIG. 1 is a block diagram illustrating the configuration of the conventional base station. The base station illustrated in FIG. 1 comprises a modulator 11 for modulating transmitting data, a spreader 12 for multiplying the modulated signal by spread code A to spread the resultant, an antenna 13 for receiving and transmitting the signal, a despreader 14 for multiplying the received signal by spread code B to despread the resultant, and a demodulator 15 for demodulating the despread signal.

Transmitted data is modulated by the modulator 11 and the modulated data is spread by the spreader 12 using spread code A, and the resultant is

transmitted via the antenna 13.

The signal received via the antenna 13 is subjected to despread processing by the despreader 14 using spread code B, and the despread signal is demodulated by the demodulator 15 to extract received data.

FIG. 2 is a block diagram of the configuration of the conventional communication terminal. The communication terminal illustrated in FIG. 2 comprises an antenna 21 for receiving and transmitting a signal, a despreader 22 for multiplying the received signal by spread code A to despread the resultant, a demodulator 23 for demodulating the despread signal, a reception power measuring section 24 for measuring a reception power value from the demodulation result, a modulator 25 for modulating transmitted data, a spreader 26 for multiplying the modulated signal by spread code B, and transmission power controller 27 for performing transmission power control based on the reception power value and the like.

Herein, the reception power measuring section 24 provides average processing to the measured reception power value in order to suppress the momentary variation of the reception power value caused by fading and the like, and outputs the reception power average value to the transmission power controller 27.

The signal received via the antenna 21 is subjected to despread processing by the despreader 22 using spread code A, and the despread signal is demodulated by the demodulator 23, so that received data is extracted and the demodulation result is outputted to the reception power measuring section 24. Then, reception power is measured from the demodulation result by the reception power measuring section 24 and the measurement result is inputted to the transmission power controller 27, and a transmission power value is determined by the transmission power controller 27 based on the reception power value and the like.

Transmitted data is modulated by the modulator 25, and the modulated data is subjected to spread processing by the spreader 26 using spread code B. Power is amplified by the transmission power controller 27 based on the determined transmission power value, and the resultant is transmitted as a radio signal from the antenna 21.

In this way, according to the conventional radio transmission system, the base station transmits a signal from one antenna, and the communication terminal performs transmission power control of the open loop based on the reception power of the received signal.

However, since the communication terminal of the conventional radio transmission system provides

average processing to the measured reception power value, it takes much time to suppress the momentary variation to calculate a high accurate reception power average value when the fading variation is slow, and this causes a problem in which transmission power control of the open loop cannot be performed at high speed and with high accuracy.

Disclosure of Invention

It is an object of the present invention is to provide a communication terminal apparatus, a base station apparatus, and a transmission power control method that are capable of calculating a reception power average value at high speed and with high accuracy even when a fading variation is slow, and are capable of performing transmission power control of an open loop at high speed and with high accuracy.

This object can be attained when signals orthogonal to each other are transmitted as radio signals from different antennas placed in parallel at the base station side, and reception power of the respective received signals are measured and combined and transmission power control of the open loop is performed based on the combined reception power at the communication terminal side.

Brief Description of Drawings

FIG. 1 is a block diagram illustrating the

configuration of the conventional base station;

FIG. 2 is a block diagram illustrating the configuration of the conventional communication terminal;

FIG. 3 is a block diagram illustrating the configuration of the base station according to one embodiment of the present invention; and

FIG. 4 is a block diagram illustrating the configuration of the communication terminal according to the above embodiment.

Best Mode for Carrying Out the Invention

An embodiment of the present invention will be specifically explained with reference to the drawings accompanying herewith.

FIG. 3 is a block diagram illustrating the configuration of the base station according to one embodiment of the present invention. Additionally, in the following explanation, it is assumed that a transmission sequence of the base station is 2 in order to simplify the explanation.

In the base station illustrated in FIG. 2, a data divider 101 divides transmitting data to the amounts corresponding to the number of antennas. A data dividing method includes a method for dividing data by serial/parallel conversion or a method for simply dividing the same data in order to be transmitted from each antenna, and the like.

A modulator 102 and a modulator 103 modulate transmitting data divided and a spreader 104 multiplies the modulated signal by spread code A1 and spreads the resultant. A spreader 105 multiplies the modulated signal by spread code A2 and spreads the resultant. Here, spread code A1 and spread code A2 are codes, which are orthogonal to each other. Multiplication of signals by the spread codes, which are orthogonal to each other, establishes the relationship in which an output signal of the spreader 104 and an output signal of the spreader 105 are orthogonal to each other.

An antenna 106 transmits the output signal of the spreader 104 as a radio signal, and an antenna 107 transmits the output signal of the spreader 105 as a radio signal. Also, the antenna 106 and the antenna 107 receive the signals transmitted from the communication terminal.

A despreader 108 multiplies the received signal by spread code B and despreads the resultant, and a demodulator 109 demodulates the despread signal and extracts received data.

An explanation will be next given of the flow of the signals transmitted and received at the base station of FIG. 3. Transmitted data is divided to the amounts corresponding to the plurality of antennas and modulated by the modulator 102 and the modulator 103, and the modulated data is inputted

into the spreader 104 and the spreader 105. Then, the spreader 104 and the spreader 105 spread respective divided data using spread code sequences, which are orthogonal to each other, respectively.

The spread signals are transmitted in parallel from the antenna 106 and the antenna 107. In addition, radio signals transmitted in parallel from the different antennas are subjected to the fading variations, which are independent of each other.

The signals received by the antenna 106 and the antenna 107 are subjected to despread processing by the despreader 108 using spread code B. The despread signals are demodulated by the demodulator 109, so that received data is extracted.

An explanation will be next give of the configuration of the communication terminal according to this embodiment with reference to the block diagram illustrated in FIG. 4.

As the communication terminal illustrated in FIG. 4, an antenna 201 transmits a signal as a radio signal, and receives a signal transmitted from the base station. A despreader 202 and a despreader 203 multiply the received signals by the same codes as spread code A1 and spread code A2 used in the transmitting side, and despread the resultants, respectively. A demodulator 204 demodulates the signals despread by use of spread code A1 and a demodulator 205 demodulates the signals despread by

use of spread code A2, and a data configuring section 206 configures demodulated data back to the pervious data format to which no data division is subjected.

A reception power measuring section 207 measures reception power from the demodulation result of the demodulator 204, and averages them. A reception power measuring section 208 measures reception power from the demodulation result of the demodulator 205, and averages them. It is noted that a reception power measuring section 207 and a reception power measuring section 208 generally measure reception power of a known signal portion such as a Pilot Symbol, a Midamble, and the like.

A reception power combiner 209 combines the reception power average values calculated by the reception power measuring sections 207 and the reception power measuring section 208. The method for combining reception power includes a simply calculating method, a method for weighting the respective reception power and adding them thereafter, and the like. In the case of weighting the respective reception power and adding them thereafter, transmission power can be controlled accurately as compared with the case of using the value obtained by simply adding the reception power of the respective data.

A modulator 210 modulates transmitting data. A spreader 211 multiplies the modulated signal by

spread code B and spreads the resultant. A transmission power controller 212 determines a transmission power value P_{UE}, which is given by the following expression (1), based on the combined reception power average value and the like, and amplifies power of the transmitting signal to the corresponding transmission power value.

$$P_{UE} = L_p + I_{BTS} + C \quad \ldots (1)$$

where L_p is a propagation loss, which is a difference between the transmission power value of the base station and the reception power average value combined by the reception power combiner 209, I_{BTS} is an interference power value at the base station, and C is a constant. Additionally, the value of C is taught to the communication terminal apparatus from the base station apparatus via a layer 3.

An explanation will be next given of the flow of the signal transmitted and received at the communication terminal of FIG. 4. The signal received by the antenna 201 is subjected to despread processing by use of spread code A1 at the despreader 202, and is subjected to despread processing by use of spread code A2 at the despreader 203, respectively. The signal despread by use of spread code A1 is modulated by the demodulator 204, and the demodulation result is inputted to the reception power measuring section 207. The signal despread by use of spread code A2 is modulated by the demodulator

205, and the demodulation result is inputted to the reception power measuring section 208. The data configuring section 206 configures demodulated data back to the pervious data format to which no data division is subjected, obtaining received data.

Moreover, reception power is measured by the reception power measuring section 207 based on the demodulation result of the demodulator 204 and reception power is measured by the reception power measuring section 208 based on the demodulation result of the demodulator 205, and the measurement results of the receptive reception power is inputted to the reception power combiner 209.

Then, the respective reception power values are combined by the reception combiner 209, and the transmission power controller 212 determines a transmission power value based on the combined reception power, the transmission power value of the base station, and the target reception power value at the base station.

Transmitting data is modulated by the modulator 210, and the modulated data is subjected to despread processing at the spreader 211 by use of spread code B. Then, the despread transmitting signal is amplified to the corresponding transmission power value by the transmission power controller 212, and the resultant is transmitted as a radio signal from the antenna 201.

Hence, transmission of signals, which are orthogonal to each other, from the different antennas at the base station side makes it possible to measure reception power of the plurality of received signals whose fading conditions are independent of each other at the communication terminal side. This makes it possible to reduce the time which lapses before the momentary variation is suppressed.

Additionally, the above embodiment has used the method in which the respective transmitting signals are multiplied by the spread codes orthogonal to each other in order to explain the method for making the respective transmitting signals orthogonal to each other. The present invention, however, can obtain the same effect by making the transmitting signals orthogonal to each other using the other method, for example, in which the transmitting signals orthogonal to each other are multiplied by the same spread code.

As is obvious from the above explanation, according to the present invention, the signals, which are orthogonal to each other, are transmitted from the different antennas at the base station side, and reception power of the plurality of received signals whose fading conditions are independent of each other is measured at the communication terminal side. This makes it possible to reduce the time which lapses before the momentary variation is suppressed,

and to perform transmission power control of the open loop at high speed and with high accuracy even when the fading variation is small.

This application is based on the Japanese Patent Application No. HEI 11-337623 filed on November 29, 1999, and the Japanese Patent Application No. 2000-076032 filed on March 17, 2000, entire content of which is expressly incorporated by reference herein

Industrial Applicability

The present invention is suitable for use in a communication terminal apparatus that performs transmission power control of an open loop and a base station apparatus in a CDMA radio communication system.

CLAIMS

1. A communication terminal apparatus comprising:

despreading means for despreading a plurality of received signals orthogonal to each other, respectively;

reception power measuring means for measuring reception power of the respective despread data;

reception power combining means for combining the respective measured reception power of data; and

transmission power controlling means for controlling transmission power based on the combined reception power.

2. The communication terminal apparatus according to claim 1, wherein said combining means weights the respective measured reception power of data to add the weighted reception power.

3. A base station apparatus that performs radio communication with the communication terminal apparatus described in claim 1, said base station comprising:

modulating means for modulating a plurality of transmitting data to spread signals orthogonal to each other; and

transmitting means for transmitting said spread signals in parallel as radio signals from different antennas.

4. The base station apparatus according to claim

3, wherein said modulating means divides one transmitting data into the plurality of transmitting data and multiplies the respective transmitting data by spread codes orthogonal to each other.

5. The base station apparatus according to claim 3, wherein said modulating means multiplies each of the plurality of transmitting data orthogonal to each other by the same spread code.

6. A transmission power control method wherein a plurality of spread signals orthogonal to each other is transmitted in parallel as a radio signal from different antennas at a base station apparatus side, and received signals are despread using the same spread code as used at the transmitting side so that reception power is measured and combined, and transmission power is controlled based on the combined reception power at a communication terminal apparatus side.

ABSTRACT

An antenna 20 receives signals orthogonal to each other transmitted from different antennas of a base station, and a despreader 202 and a spreader 203 despread the respective received signals using the same spread code used in the base station, a demodulator 204 and a demodulator 205 demodulate the despread signals, a reception power measuring section 207 and a reception power measuring section 208 measure reception power from the demodulation results, a reception power combiner 209 combines measured reception power, and a transmission power controller 212 controls transmission power based on combined reception power. This makes it possible to perform transmission power control of an open loop at high speed and with high accuracy even when a fading variation is small.

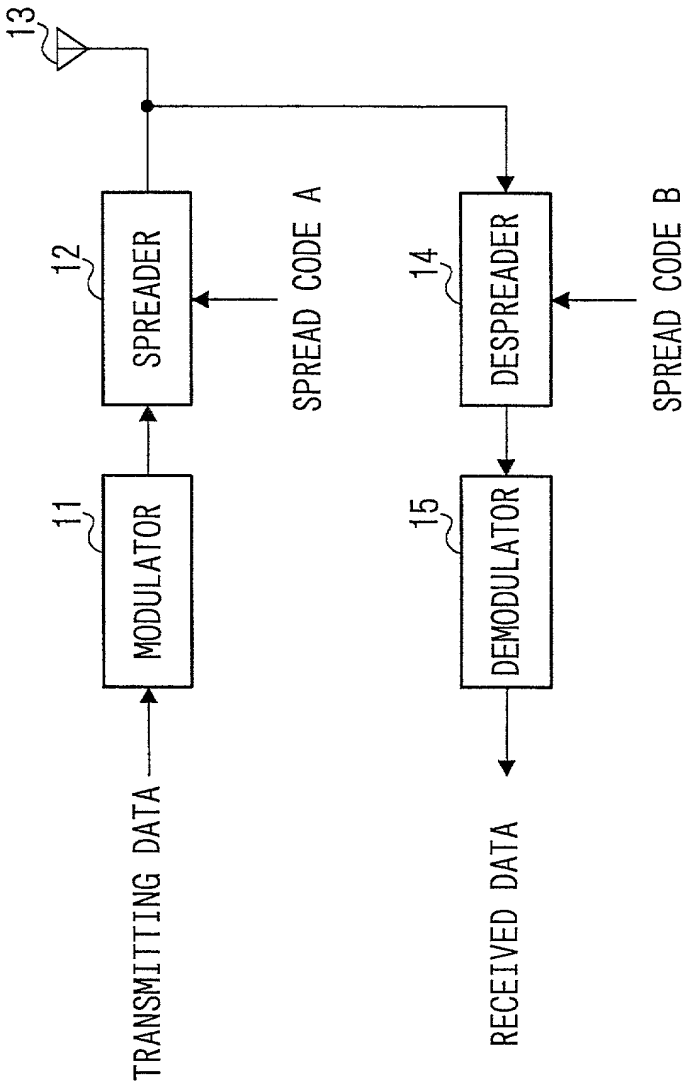

FIG. 1

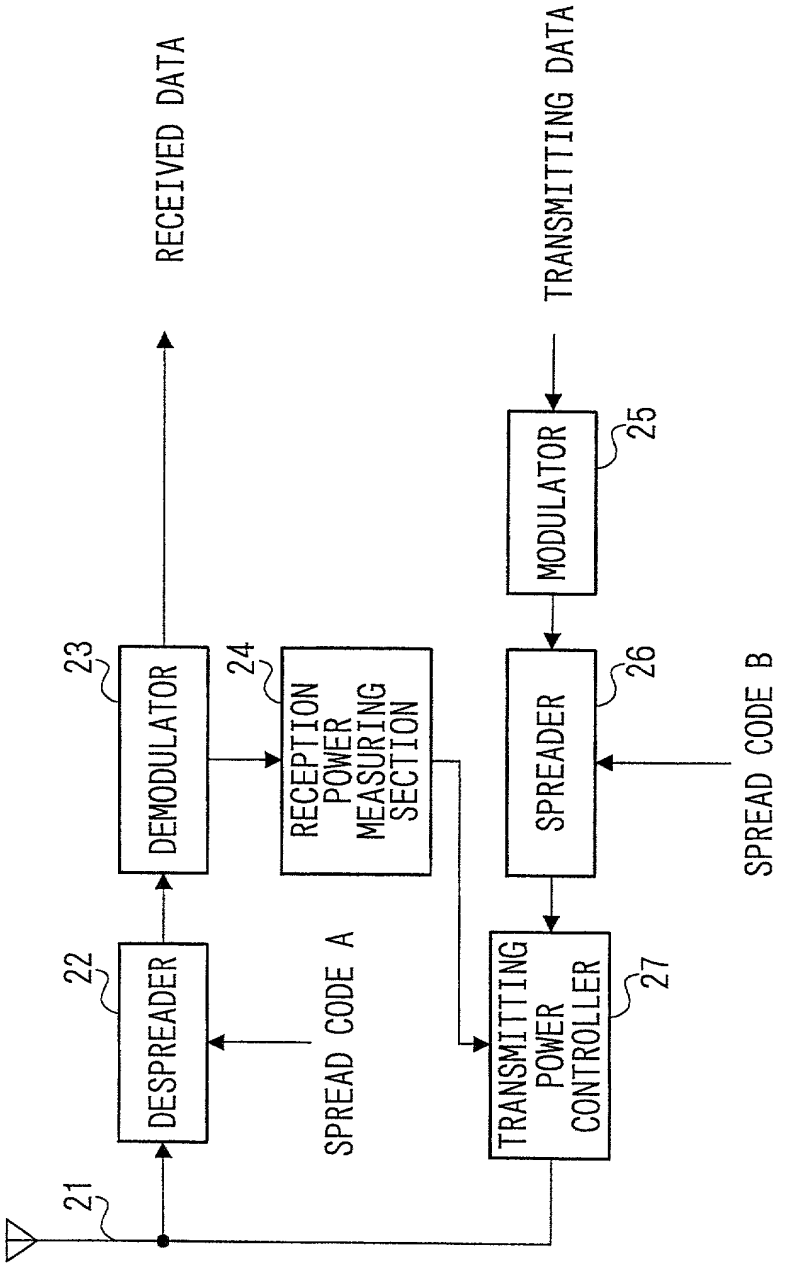

FIG. 2

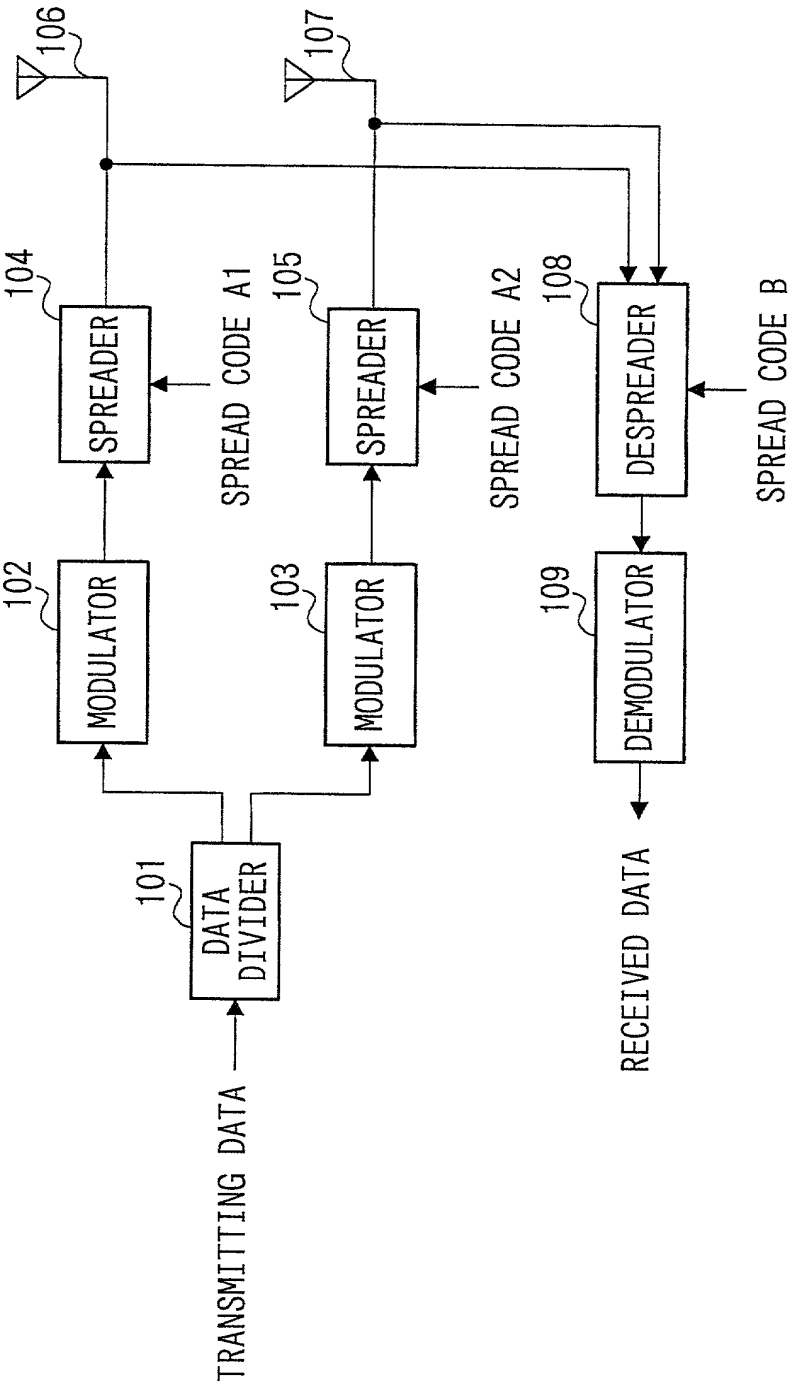
106
107
104
SPREADER
SPREAD CODE A1
105
SPREADER
SPREAD CODE A2
108
DESPREADER
SPREAD CODE B
102
MODULATOR
103
MODULATOR
109
DEMODULATOR
101
DATA DIVIDER
TRANSMITTING DATA
RECEIVED DATA

FIG. 3

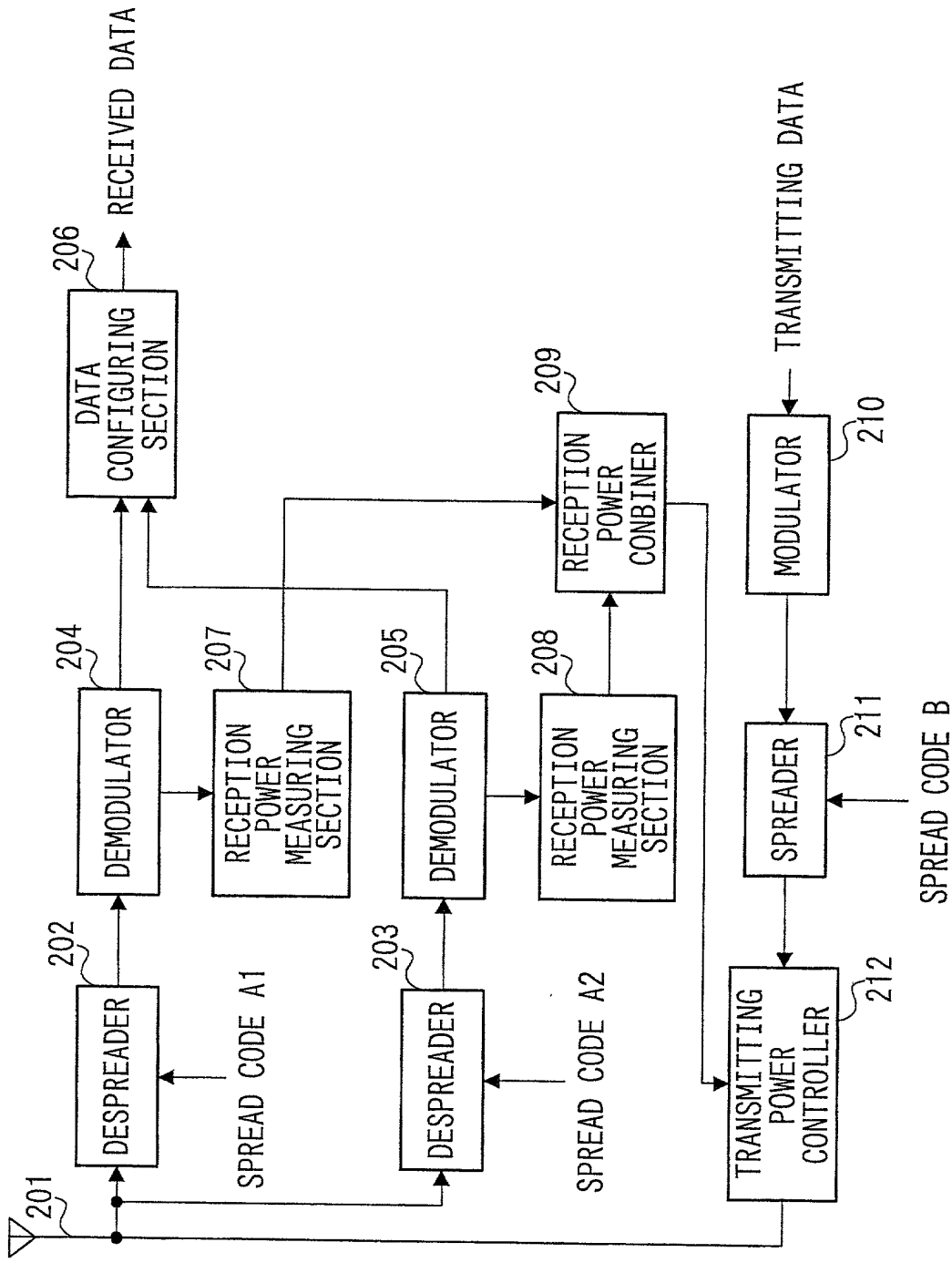
201
DESPREADER
202
SPREAD CODE A1
DEMODULATOR
204
RECEPTION POWER MEASURING SECTION
207
DESPREADER
203
SPREAD CODE A2
DEMODULATOR
205
RECEPTION POWER MEASURING SECTION
208
DATA CONFIGURING SECTION
206
RECEIVED DATA
RECEPTION POWER CONBINER
209
TRANSMITTING POWER CONTROLLER
212
MODULATOR
210
TRANSMITTING DATA
SPREADER
211
SPREAD CODE B

FIG. 4

APPLICATION FOR UNITED STATES PATENT
Declaration for Patent Application

As a below named inventor, I hereby declare that:
My residence, post office address and citizenship are as stated below next to my name.
I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on

the invention entitled: COMMUNICATION TERMINAL APPARATUS, BASE STATION APPARATUS, AND TRANSMISSION POWER CONTROL METHOD
the specification of which 2 (file no. ______________________)
(check at least one) 3 [x] is attached hereto
4 [ ] was filed on __________ as (5) U.S. Application Serial No. ______________
6 [ ] and was amended on ______________________________ (if applicable)

Use this portion only if you are entering the U.S. National phase based on a PCT International Application designating the U.S.

7 [x] was filed as PCT international application
8 Number PCT/JP00/08336
9 on November 27, 2000
and was amended under PCT Article(s) 19 and/or 34
10 on ______________________________ (if applicable).
11 priority date claimed in PCT International Application

(Country)	(Number)	(Day/Month/Year Filed)
JAPAN	JP11-337623	29/November/1999
JAPAN	JP2000-076032	17/March/2000

I hereby declare that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended, by any amendment referred to above.

I acknowledge the duty to disclose to the United States Patent and Trademark Office all information known to me which is material to patentability in accordance with Title 37, Code of Federal Regulations, §1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application (s) for patent or inventor's certificate listed below and have also identified below any foreign application(s) for patent or inventor's certificate or any PCT international application(s) designating at least one country other than the United States of America filed by me on the same subject matter having a filing date earlier than that of the application(s) on which priority is claimed.

Prior (Foreign) Application(s) any Priority Claims Under 35 U.S.C. 119 — Priority Claimed

(Country)	(Number)	(Day/Month/Year Filed)	Yes	No
			[ ]	[ ]
			[ ]	[ ]

Priority Claim(s) from U.S. Provisional Application(s) - I hereby claim the benefit under Title 35, United States Code, §119(e) of any United States provisional application(s) listed below:

Application No.	Day/Month/Year Filed	Application No.	Day/Month/Year Filed

Do not use this portion to identify a PCT application if the parent application is the U.S. National phase of the PCT application

I hereby claim the benefit under Title 35, United States Code, 120 of any United States application(s) or PCT international application(s) designating the United States of America that is/are listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in that/those prior application(s) in the manner provided by the first paragraph of Title 35, United States Code §112, I acknowledge the duty to disclose to the United States Patent and Trademark Office all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, §1.56 which became available between filing date of the prior application and the national or PCT international filing date of this application.

13 ____________ (U.S. Application Number) ____________ (U.S. Filing Date) ____________ Status (patented, pending, abandoned)

I hereby appoint the following attorneys of the firm of Stevens, Davis, Miller & Mosher, L.L.P. as my attorneys of record with full power of substitution and revocation to prosecute this application and to transact all business in the Patent and Trademark Office:

James E. Ledbetter, Reg. No. 28732; Thomas P. Pavelko, Reg. No. 31689; and Anthony P. Venturino, Reg. No. 31674.

ALL CORRESPONDENCE IN CONNECTION WITH THIS APPLICATION SHOULD BE SENT TO STEVENS, DAVIS, MILLER & MOSHER, L.L.P., 1615 L Street, N.W., Suite 850, Washington, D.C. 20036, TELEPHONE (202) 408-5100, FACSIMILE (202) 408-5200.

See page 2 for signature lines

See other side for instructions for completing this form

STEVENS, DAVIS, MILLER & MOSHER, L.L.P.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful statements may jeopardize the validity of the application or any patent issuing thereon.

PAGE 2 OF U.S.A. DECLARATION FORM

14a Typewritten Full Name of Sole or First Inventor 1-00

Takashi (Given Name) | (Middle Name) | KITADE (Family Name)

15a Inventor's Signature: Takashi Kitade

16a Date of Signature: July (Month) 6 (Day) 2001 (Year)

17a Residence: Yokosuka-shi JPX (City) | Kanagawa (State or Province) | JAPAN (Country)

18a Citizenship: JAPAN

19a Post Office Address (*Insert complete mailing address, including country*): 6-2-903, Hikari no Oka, Yokosuka-shi, Kanagawa 239-0847 JAPAN

14b Typewritten Full Name of Sole or Second Inventor 3-00

Kazuyuki (Given Name) | (Middle Name) | MIYA (Family Name)

15b Inventor's Signature: Kazuyuki Miya

16b Date of Signature: July (Month) 6 (Day) 2001 (Year)

17b Residence: Kawasaki-shi JPX (City) | Kanagawa (State or Province) | JAPAN (Country)

18b Citizenship: JAPAN

19b Post Office Address (*Insert complete mailing address, including country*): 5-26-25, Kamiasao, Asao-ku, Kawasaki-shi, Kanagawa 215-0021 JAPAN

14c Typewritten Full Name of Sole or Third Inventor 4-00

Katsuhiko (Given Name) | (Middle Name) | HIRAMATSU (Family Name)

15c Inventor's Signature: Katsuhiko Hiramatsu

16c Date of Signature: July (Month) 6 (Day) 2001 (Year)

17c Residence: Yokosuka-shi JPX (City) | Kanagawa (State or Province) | JAPAN (Country)

18c Citizenship: JAPAN

19c Post Office Address (*Insert complete mailing address, including country*): 2-56-14-1212, Kinugasasakae-cho, Yokosuka-shi, Kanagawa 238-0031 JAPAN

14d Typewritten Full Name of Sole or Fourth Inventor 5-00

Osamu (Given Name) | (Middle Name) | KATO (Family Name)

15d Inventor's Signature: Osamu Kato

16d Date of Signature: July (Month) 6 (Day) 2001 (Year)

17d Residence: Yokosuka-shi JPX (City) | Kanagawa (State or Province) | JAPAN (Country)

18d Citizenship: JAPAN

19d Post Office Address (*Insert complete mailing address, including country*): 5-45-G302, Shonantakatori, Yokosuka-shi, Kanagawa 237-0066 JAPAN

*Note to Inventor: Please sign name on line 15 exactly as it appears in line 14 and insert the actual date of signing on line 16. If there are more than four inventors, please add a copy of this page for identification and signatures for the additional inventors.

INSTRUCTIONS FOR COMPLETION OF THIS FORM

line 1 Insert the same title as is used on the specification and in the assignment.

line 2 Is optional but is provided so that you can use it to identify more readily an application prior to the time that the Patent Office application serial number is assigned. We suggest that the specification, drawings and declaration always bear a file number since it can help to get the papers together in case they become inadvertently separated. In instances where the specification is filed without a signed declaration form (under 37 CFR §1.53) a file number on a later-received separate form will assist us in associating it with the correct case.

line 3 Check this box if the specification, claims and drawing (if any) are attached to this declaration form, e.g., when filing a new patent application.

lines 4-5 Are only used in an instance where the application is already on file and the declaration from is being separately filed, e.g.,when the application was originally filed without a signed declaration or where the Patent Office has required a new declaration because of a deficiency in the original declaration. In such an instance the Patent Office will require that lines 4 and 5 be completed with the filing date and application serial number already assigned.

line 6 Is used in conjunction with line 5 but only when there have been one or more amendments to the specification or claims. Line 6 is also used when the Examiner requires a new declaration because claims inserted by amendment cover subject matter not originally claimed (37 CFR §1.67).

lines 7-11 Are for PCT (Patent Cooperation Treaty) cases and are used only when you are entering the U.S. National phase (Chapter I or II) based upon a previously filed PCT International application designating the U.S.

line 7 Check this box if this is a PCT National Phase application.

line 8 Insert PCT International application number.

line 9 Insert date of filing of PCT International application.

lines 10-11 Insert the date of all amendments filed in the PCT International application. Such amendments are optional, so this line at times will not be used.

line 12a Is used in the following instances:

(i) If a single priority is being claimed from a foreign application you need to list only the first-filed application; you do not need to list other countries if all applications were filed within one year of the U.S. filing.

(ii) If multiple priorities are being claimed, from a plurality of applications filed in one or more countries, you must list the first filed application for each aspect of the invention. Example: if aspect A of the invention was disclosed in an application filed 11 months earlier in country X and aspect B was disclosed 9 months earlier in an application filed in country Y, then the applications in both countries X and Y must be identified. Only the first application for each aspect of the invention needs to be identified provided all applications on that aspect were filed within one year prior to the U.S. filing.

(iii) If a non-priority application is being filed you must list all applications in all countries where corresponding foreign applications were filed more than one year prior to the U.S. filing. This is so the Examiner can check to see if any of those applications were published or patented early enough to be prior art against the U.S. application.

(iv) If there are more than two applications to be listed we suggest that you type in on this form only "See attached Schedule A" and then list all of the previous applications on an attached sheet.

line 12b Is used to claim priority under 35 USC §119(e) based on a provisional application filed within one year of the filing of the instant application. More than one provisional application may be identified provided neither was filed more than one year earlier.

line 13 This block is used only in instances where there is a previously filed U.S. non-provisional application which was copending at the time the present application was (or is being) filed. that previous application could be a U.S. non-provisional application or the National Phase of a PCT allocation. In such a case the present application may be entitled to the priority of the previous application's U.S. filing date (and consequently the foreign priority thereof) provided the present application is identified as a continuing application (continuation, divisional or continuation-in-part) of the earlier (parent) application. If the foregoing is applicable, please fill in one line for each such prior application.

line 14 Type the inventor's proper legal name in the order specified, e.g., "John B. JONES" or "J. Bob JONES" if the inventor so prefers. It is not acceptable to use only initials such as "J. B. JONES."

line 15 The inventor's "signature" may be his (or her) usual manner of signing but it is preferable that the inventor simply write his (or her) name in his (or her) own cursive handwriting in the same order as on line 14, e.g., given name, middle initial and Family name.

line 16 Insert the actual date of signature.

line 17 Insert simply the city and state or country, e.g., "Paris, France", of the inventor's residence, not citizenship. No street address or postal code is required on this line.

line 18 Insert the inventor's citizenship. The statement of citizenship (or subject of) is a statutory requirement (35 USC §115). Simply the name of the country of citizenship, e.g., "Japan" is sufficient.

line 19 Insert the inventor's mailing address. The purpose of requiring the post office address is to enable the Patent Office to communicate directly with the inventor if desired, such as in the case of death of the U.S. attorney. It should be the address where the inventor customarily receives his (or her) mail and should include the postal code. If applicable it can be the inventor's business address or address at place of employment.

Applicants are reminded that the U.S. Patent and Trademark Office has very strict requirements as to proper execution of an application. The applicant should make sure that he reviews the declaration, prior to signing to make sure the declaration properly identifies the application and all relevant information; and should review the specification and claims (including drawings, if any) before signing the declaration. Failure to do so will require the filing of a supplemental declaration --- 37 CFR §1.67(c).

Any handwritten changes to the specification, claims or drawings must be in ink personally by all of the inventors prior to signing the declaration and the adjacent left margin must be initialed and dated by all of the inventors, e.g., "JBJ 6-9-91".

Please let us know if there are any questions regarding proper completion of this form. Thank you.

An assignment, a separate document requiring separate signature and dating may be enclosed. Please look for it and sign and date it in the same manner as in lines 15 and 16 above.